

### **REMARKS**

Claims 1-5 are pending in the subject application. Claims 1, 2, 4 and 5 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Mabuchi et al (US Patent No. 5,645,644) in view of Yoshiki et al (US Patent No. 5,843,236). Claims 1-5 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Katayama et al (US Patent No. 5,545,258) in view of Yoshiki et al (US Patent No. 5,843,236).

The Office indicates in the Advisory Action that 35 U.S.C. §112, second paragraph rejections of claims 1-5 have been overcome by Applicants' March 8, 2004 response.

Claim 1 has been amended herein. Support for the amendments to claim 1 is found throughout the Specification and claims, as filed, and no new matter is presented by the amendment. Favorable reconsideration in light of the remarks which follow is respectfully requested.

#### **1. 35 U.S.C. §103 Rejections**

##### ***Mabuchi et al in view of Yoshiki et al***

Claims 1, 2, 4 and 5 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Mabuchi et al (US Patent No. 5,645,644) in view of Yoshiki et al (US Patent No. 5,843,236). The Office acknowledges that "Mabuchi et al fail to explicitly disclose the length of the slit opening in terms of the wavelength of the microwave." However, the Office asserts that:

Yoshiki et al teach a microwave plasma processing system wherein the length of the slits are defined in term of wavelength of the microwave passing therethrough to be  $n/2$  of a free-space wavelength of the microwaves in order to uniformly transmit microwaves into a process space (column 10, lines 12-26, column 19, lines 63-67, column 32, lines 8-11).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to optimize the slit dimension according to that taught by Yoshiki et al in order to generate plasma more efficiently and uniformly.

The Office further asserts in the March 19, 2004 Advisory Action that the previous amendment does not place the application in condition for allowance because "the

present claims not clarifying the direction of propagation of microwave with respect to the surface of the dielectric window as being vertical or horizontal; and that the claims do not preclude the presence of other members such as those used in the apparatus of Mabuchi et al."

Applicants respectfully traverse. Applicants claim, in amended claim 1, a plasma processing apparatus comprising: a process chamber for processing by means of plasma; microwave transmission means for transmitting microwave to said process chamber; a dielectric for radiating the microwave transmitted by said microwave transmission means into said process chamber; and a slot antenna plate formed of conductor, placed on a side, facing said process chamber, of said dielectric, and including an opening for passing the microwave therethrough radiated from said dielectric wherein said opening of said slot antenna has a longer side with its length equal to half the space wavelength of the microwave. As further set out, the microwave propagates perpendicularly to the surface of the dielectric. Further, the slot antenna plate does not support the dielectric.

According to the Office, Mabuchi describes a dielectric (microwave window 4) with a slot antenna plate (window support member 5 having openings 6).

However, Mabuchi's window support member 5 having openings 6 and beams 5b does not qualify as a slot antenna plate in accordance with Applicants disclosure and claims. As specified by Applicants, Applicants' slot antenna plate: (1) includes an opening (for passing the microwave therethrough radiated from said dielectric) having a longer side with its length equal to half the space wavelength of the microwave and (2) does not support the dielectric.

Mabuchi's plasma processing apparatus has "a supporting member having beams for supporting the microwave window" (See abstract). According to Mabuchi, its plasma processing apparatus "is characterized in the provision of beams which support the microwave window and reinforce it against the pressure" (col. 2, lines 32-34). "The microwave window is actually supported by a unitary window supporting member made up of the beams and their outer frame" (Col. 2, lines 42-44).

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Thus, Mabuchi's support member supports the "dielectric" (microwave window) contrary to Applicants' slot antenna plate. Thus, Mabuchi's support member does not qualify as a slot antenna plate. Further, as acknowledged by the Office, Mabuchi fails to "disclose the length of the slit opening in terms of the wavelength of the microwave", which is an element of Applicants' claims.

In sum, Mabuchi does not describe a slot antenna plate in accordance with Applicants' claims. In particular, Applicants require that the slot antenna plate does not support the dielectric. The portion of Mabuchi which the Office asserts acts as a slot antenna plate is specifically a support member specifically provided to support the "dielectric" (microwave window). Further, as acknowledged by the Office, the support member does not have openings having a longer side with its length equal to half the space wavelength of the microwave, as required by Applicants' claims.

Applicants respectfully submit that Yoshiki does not remedy these deficiencies in Mabuchi.

As previously set forth, the "slot antenna plate" of Yoshiki (waveguide 18) includes the openings (long slots 18b, 18c) provided such that the "slot antenna plate" (waveguide 18) is not placed on a side of the dielectric (microwave transmitting window 11) facing the process chamber 7, which is required by Applicants' claims. Rather, the openings of Yoshiki (long slots 18b, 18c) are on the opposite side of the dielectric (i.e. facing the opposite direction of the process chamber). Thus, the waveguide 18 with long slots 18b, 18c does not qualify as a slot antenna plate as defined and claimed by Applicants.

Thus, neither Mabuchi nor Yoshiki describe a slot antenna plate or openings as defined and claimed by Applicants. In particular, Mabuchi does not describe or suggest (1) a slot antenna plate having an opening having a longer side with its length equal to half the space wavelength of the microwave (as acknowledged by the Office) or (2) a slot antenna plate that does not support the dielectric. These are two claim limitations clearly set forth in claim 1 but which are absent from Mabuchi. Yoshiki,

likewise does not describe or suggest a slot antenna plate in accordance with Applicants' definition of a slot antenna plate in the disclosure and claims. In particular, Yoshiki does not describe or suggest a slot antenna plate placed on the side of the dielectric that faces the process chamber. Rather, the portion of the device of Yoshiki that the Office asserts is a slot antenna plate/openings (waveguide 18/long slots 18b, 18c) is placed on the other side of the dielectric – the side that does not face the process chamber.

Regarding the Office's assertion that Yoshiki teaches a system wherein the "length of the slits are defined in term of wavelength of the microwave passing therethrough to be  $n/2$  of a free-space wavelength of the microwaves" and, thus, "it would have been obvious to one of ordinary skill in the art at the time of the invention to optimize the slit dimension (of Mabuchi) according to that taught by Yoshiki et al, Applicants respectfully disagree. As previously set forth by Applicants, the portion of the Yoshiki device asserted to be the slot antenna plate having openings (waveguide 18 and long slots 18b, 18c) is placed on the side of the dielectric that does not face the process chamber, contrary to Applicants' definition of the slot antenna plate and openings, which must be on the side of the dielectric that faces the process chamber. Thus, the portion of the Yoshiki device asserted by the Office to be the slot antenna plate (waveguide 18 with long slots 18b, 18c) does not qualify as a slot antenna plate by definition. Thus, both Yoshiki and Mabuchi fail to describe slot antenna plates. Further, the characteristics Mabuchi's openings 6 in the window support member 5 would not obviously be optimized by the slot 18b, 18c dimension of Yoshiki because these openings are located in entirely different portions of the respective devices. The openings of Mabuchi are placed right at the entrance to the process chamber between the process chamber and the "dielectric" (microwave window 4). The slots of Yoshiki are not right at the entrance to the process chamber between the process chamber and the dielectric. Rather, at the entrance to the process chamber is a window 7c, followed by a "dielectric" (microwave transmitting window 11) then the slots. Thus, one would not and could not assume that these slots 18b, 18c of Yoshiki correspond to the openings 6 of Mabuchi nor would one assume that the characteristics of Mabuchi's openings 6 could or should be "optimized" in accordance with the characteristics of the Yoshiki slots 18b, 18c.

To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure. *In re Vaack*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991). MPEP 2142.

As clearly set out above, Mabuchi does not teach or suggest all of Applicant' claim elements. In particular, as acknowledges by the Office, Mabuchi does not describe or suggest a slot antenna plate having opening(s) wherein the opening(a) have a length defined in terms of the wavelength of the microwave. Rather, this comes purely from Applicants' disclosure. Further, Mabuchi does not describe a slot antenna plate that does not support the dielectric. Rather, the element of Mabuchi that the Office asserts is a slot antenna plate is specifically provided as a support member for supporting the dielectric (microwave window). Further, Yoshiki does not remedy the deficiencies of Mabuchi. Yoshiki does not describe a slot antenna plate in accordance with Applicants' claims. Further, regarding the Office has asserted that Mabuchi can be modified so as to optimize the opening dimensions according to that taught by Yoshiki et al, as clearly set out above, the dimension referred to by the Office is a dimension of an element that does not correspond to the element in question.

Accordingly, it is respectfully submitted that claim 1 is patentable over Mabuchi in view of Yoshiki. Claims 2-5 depend from claim 1 and, likewise, are patentable over Mabuchi in view of Yoshiki.

***Katayama et al in view of Yoshiki et al***

Claims 1-5 have been rejected under 35 U.S.C. §103(a) as being unpatentable over Katayama et al (US Patent No. 5,545,258) in view of Yoshiki et al (US Patent No. 5,843,236). The Office acknowledges that "Katayama et al fail to disclose the length of

the slit in terms of the wavelength of the microwave in the dielectric window."

However, the Office asserts that:

Yoshiki et al teach a microwave plasma processing system wherein the length of the slots are defined in terms of wavelength of the microwave passing therethrough to be  $n/2$  of a free-space wavelength of the microwave in order to uniformly transmit microwaves into a process space (column 10, lines 12-26, column 19, lines 63-67, column 32, lines 8-11).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to optimize the slit dimensions according to that taught by Yoshiki et al in order to generate plasma more efficiently and uniformly.

Applicants respectfully traverse.

As acknowledged by the Office, "Katayama et al fail to disclose the length of the slit in terms of the wavelength of the microwave in the dielectric window." As set forth in Applicants' claim 1, the a slot antenna plate includes an opening for passing the microwave therethrough radiated from said dielectric wherein said opening of said slot antenna has a longer side with its length equal to half the space wavelength of the microwave.

Further, Yoshiki does not remedy the deficiencies of Katayama for the reasons set forth above. In particular, the portion of the Yoshiki device asserted to be the slot antenna plate having openings (waveguide 18 and long slots 18b, 18c) is placed on the side of the dielectric that does not face the process chamber, contrary to Applicants' definition of the slot antenna plate and openings, which must be on the side of the dielectric that faces the process chamber. Thus, the portion of the Yoshiki device asserted by the Office to be the slot antenna plate (waveguide 18 with long slots 18b, 18c) does not qualify as a slot antenna plate by definition.

Further, the characteristics Katayama's openings 51a would not obviously be optimized by the slot 18b, 18c dimensions of Yoshiki because the openings or Katayama are located in entirely different portion of the device than the openings of Yoshiki. Thus, the openings of the respective devices are not corresponding openings. The openings of Katayama are placed right at the entrance to the process chamber

between the process chamber and the "dielectric" (microwave window 45). The slots of Yoshiki are not right at the entrance to the process chamber between the process chamber and the dielectric. Rather, at the entrance to the process chamber is a window 7c, followed by a "dielectric" (microwave transmitting window 11) then the slots. Thus, one would not and could not assume that these slots 18b, 18c of Yoshiki correspond to the openings 51a of Katayama nor would one assume that the characteristics of Katayama's openings 51a could or should be "optimized" in accordance with the characteristics of the Yoshiki slots 18b, 18c.

Thus, claim 1 is patentable over Katayama et al in view of Yoshiki et al. Claims 2-5 depend from claim 1 and, likewise, are patentable over Katayama et al in view of Yoshiki et al. Reconsideration and withdrawal of the rejection is respectfully requested.

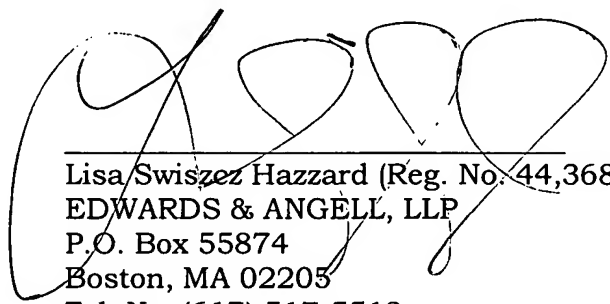
### **CONCLUSION**

In light of the above amendments, Applicant respectfully requests early consideration and allowance of the subject application.

Applicants believe that additional fees are not required in connection with the consideration of the within matter. However, if for any reason a fee is required, a fee paid is inadequate or credit is owed for any excess fee paid, you are hereby authorized and requested to charge Deposit Account No. **04-1105**.

Should the Examiner wish to discuss any of the amendments and/or remarks made herein, the undersigned attorney would appreciate the opportunity to do so.

Respectfully submitted,



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